

***What is Claimed Is:***

1. A fluid filter comprising:

a manifold having a fluid inlet with an inlet stop and a fluid outlet with an outlet stop and having a cartridge seat;

5 a cartridge, said cartridge being separable from said manifold and adapted to mount and dismount in said manifold, said cartridge having a filter housing containing a filter for filtering fluid, said cartridge also having an integral closure member having a first level and a second level;

10 a radial inlet port on a face of said first level of said closure member, said radial inlet port being in fluid communication with said fluid inlet of said manifold when said cartridge is mounted in said manifold;

an axial outlet port on a top of said second level of said closure member, said axial outlet port being in fluid communication with said fluid outlet of said manifold when said cartridge is mounted in said manifold;

15 a first boss on said closure member, said first boss being disposed to open said inlet stop when said cartridge is mounted in said manifold;

a second boss on said closure member, said second boss being disposed to open said outlet stop when said cartridge is mounted in said manifold; and

wherein said bosses engage said stops sequentially.

20 2. The fluid filter of claim 1 wherein said first and second levels are stepped.

3. The fluid filter of claim 1 wherein said bosses are in pairs.

4. The fluid filter of claim 3 wherein said pairs are opposed by about 180°.

5. The fluid filter of claim 1 further comprising ramped lugs on said manifold and on said cartridge, said ramp lugs being disposed to slidingly cooperate for rotational mounting.

6. The fluid filter of claim 5 wherein said ramped lugs include a boss and  
5 detent which engage one another upon completed mounting of said cartridge in said manifold.

7. The fluid filter of claim 1 wherein said second level has a radius less than a radius of said first level.

8. The fluid filter of claim 1 wherein said second level is above said first  
10 level.

9. The fluid filter of claim 1 wherein said first and second bosses are disposed to close said inlet stop before closing said outlet stop upon removal of said cartridge from said manifold.

10. The fluid filter of claim 1 wherein said first and second bosses are  
15 disposed to open said outlet stop before opening said inlet stop upon mounting said cartridge in said manifold.

11. The fluid filter of claim 1 wherein said first boss has an engaging face at a different angle than an engaging face of said second boss.

12. The fluid filter of claim 1 wherein said first boss has a different radial  
20 length than said second boss.

13. The fluid filter of claim 1 wherein said second boss is placed at a different radial position on said second level relative to a placement of said first boss on said first level.

14. The fluid filter of claim 1 wherein said stops are assembled with compression springs of different strengths.

15. The fluid filter of claim 1 wherein said radial inlet port is larger than said axial outlet port.

5 16. The fluid filter of claim 1 further comprising at least one seal.

17. The fluid filter of claim 16 wherein said seal is an O – ring.

18. The fluid filter of claim 1 further comprising a fluid tight seal disposed to seal said manifold and said cartridge from fluid leakage before either of said inlet stop or said outlet stop is engaged.

10 19. The fluid filter of claim 16 wherein said inlet port is sealed from fluid communication with said outlet port.

20. A method of making a fluid filter assembly comprising:

installing in a manifold an inlet stop and an outlet stop;

enclosing a fluid filter in a filter housing;

15 fabricating on said filter housing a closure member having a radial inlet port on a first step and an axial outlet port on a second step;

matching ramped lugs on said manifold and said closure member, said ramped lugs being threadingly engageable for mounting;

assembling two O – rings with said closure member such that said manifold and said closure member are sealed against fluid leakage during removal and installation; and

disposing a first boss on said first step and a second boss on said second step such that said inlet stop and said outlet stop are sequentially engaged by said first

and second boss upon installation and removal of said filter housing.

21. The method of making a fluid filter of claim 20 further comprising stepping said first and second levels.

22. The method of making a fluid filter of claim 20 further comprising pairing  
5 said bosses.

23. The method of making a fluid filter of claim 22 further comprising opposing said pairs by about 180°.

24. The method of making a fluid filter of claim 20 further comprising fabricating ramped lugs on said manifold and on said cartridge, said ramp lugs being  
10 disposed to slidably cooperate for rotational mounting.

25. The method of making a fluid filter of claim 24 further comprising fabricating said ramped lugs to include a boss and a detent which engage one another upon completed mounting of said cartridge in said manifold.

26. The method of making a fluid filter of claim 20 further comprising making  
15 said second level with a radius less than a radius of said first level.

27. The method of making a fluid filter of claim 20 further comprising placing said second level above said first level.

28. The method of making a fluid filter of claim 20 further comprising disposing said first and second bosses to close said inlet stop before closing said outlet  
20 stop upon removal of said cartridge from said manifold.

29. The method of making a fluid filter of claim 20 further comprising disposing said first and second bosses to open said outlet stop before opening said inlet stop upon mounting said cartridge in said manifold.

30. The method of making a fluid filter of claim 20 further comprising angling an engaging face of said first boss at a different angle than an engaging face of said second boss.

31. The method of making a fluid filter of claim 20 further comprising varying  
5 a length of said first boss from a length of said second boss.

32. The method of making a fluid filter of claim 20 further comprising placing said second boss at a different radial position on said second level relative to a placement of said first boss on said first level.

33. The method of making a fluid filter of claim 20 further comprising  
10 assembling said stops with compression springs of different strengths.

34. The method of making a fluid filter of claim 20 further comprising making said radial inlet port larger than said axial outlet port.

35. The method of making a fluid filter of claim 20 further comprising sealing said cartridge and said manifold.

15 36. The method of making a fluid filter of claim 35 wherein said seal is an O-ring.

37. The method of making a fluid filter of claim 20 further comprising sealing said manifold and said cartridge from fluid leakage before either of said inlet stop or said outlet stop is engaged.

20 38. The method of making a fluid filter of claim 35 further comprising sealing said inlet port from fluid communication with said outlet port.